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Using Accounting Information to Forecast Market Performance

Tyler Atanasov

Using Accounting Information to Forecast Market Performance

I. Introduction

Can accounting information be used to forecast the market performance of stocks? In this study, we wanted to find out how well company's financial information and accounting information can be used to forecast their performance in the market. Using various accounting variables, we were able to see what factors determine a company's performance to be able to make future investment decisions. This study was done with previous research in mind; previous studies have been published to try to forecast market performance from accounting data. Different from previous studies, our study uses quarterly data instead of annual data, as we have more observations and can be more accurate due to the fact that public companies publish quarterly financial statements. As a result, we are able to more closely match the accounting data with the corresponding stock market data, thereby leading us to be able to find conclusive results. Additionally, a longer sample period for our data gives us more observations that we can draw from. Lastly, this study also uses the most current data available to make sure that the relations we find in the data are current and applicable to the current market.

The foundation for this paper is from Basu's research (1977), which examined investment performance of common stocks and looked at that in relation to their price and earnings. Basu's work is discussed in detail in the literature review portion of this paper. In addition, much of the basis for Basu's work came from Eugene F. Fama. First, Fama (1965) examined stock market prices in relation to the random walk theory; secondly, Fama (1968)

examined returns and risk in the stock market and the Sharpe-Lintner models and clarified them; lastly, Fama (1970) reviewed and commented on empirical and theoretical evidence and studies pertaining to the area of efficient markets, where information is fully reflected in a stock's price. These studies establish the basis and underlying assumptions for this study of accounting data in the stock market.

The organization of this paper is as follows. In Section II, a literature review based on previous studies is presented. Section III provides the data sample and methodology. Results of this study are discussed in Section IV. Lastly, conclusions and further implications of this study are found in Section V.

II. Literature Review

Inefficiencies in the stock market have been well documented by previous studies that found relations between some types of accounting information that is correlated to abnormal returns in the market. Basu (1977) examined the relation between stock performance and earnings-price ratios. In that study, Basu found that low E/P portfolios have, on average, earned higher absolute and risk-adjusted rates of return than high E/P portfolios. Basu concluded that publicly available information is not instantaneously impounded in security prices, and there seem to be lags and frictions in the adjustment process. Therefore, E/P ratios would warrant an investor's attention when they form or rebalance a portfolio. Lakonishok, et al. (1994) examined a contrarian investment strategy where the idea was to buy out-of-favor or value stocks. According to Lakonishok, et al, value stocks significantly outperformed their corresponding glamour stock over the period of the study. The authors looked at various accounting measures such as earnings to price and book to market to determine which stocks were value and

which ones were glamour stocks. Their results show that value stocks consistently outperform the glamour stocks, and they even suggested that this could explain why money managers consistently underperform the market return.

Additionally, Fama and French (1992) examined expected stock returns looking for variables that would explain different returns. They examined the Sharpe-Lintner-Black model and found that their results did not support the argument that stock returns are fully explained by beta. They tried to explain the cross-section variation of stock returns using two variables, size and book-to-market ratio. Their only questions were if the relation between returns and those two variables persists through time and if this relation resulted from rational or irrational asset pricing. They found that the relation between stock returns and book-to-market ratio persisted thus far and there was no evidence that it had deteriorated over time. Broussard et al. (2005) took some of the conclusions from Basu, and Fama and French to look at the role of growth in explaining long-term investment returns. They determined that growth rates of earnings, sales, and assets are important in explaining the future growth of a firm. After determining this relation, they examined the relation between past and future growth rates and holding period returns. They found that there was an inverse relation between those variables and concluded that slow growth firms produce higher returns than fast growth firms.

Additionally, Charles Holt (1962) was very interested in how growth affects a stock price and how a high growth rate affects future prices. He found that estimating the future growth of earnings is an inherent risk in the valuation of a firm. He found some advantages of growth stocks in relation to value stocks. First, the tax advantage of capital gains is not stated in the estimate for the investor. Second, earnings do not terminate

sharply at one point in time, but rather taper off in a gradual decline. Lastly, the high growth rate would last longer than the models would commonly predict. These three papers all focused on the returns of growth versus value stocks and how to predict and explain these returns.

Researchers have also been looking at different accounting information to try to predict returns or the effect that certain information will have on stock market prices. In particular, Ball and Brown (1968) looked at accounting income and the empirical evaluation of the information provided by this number. They found that net income is of particular interest to investors and that this information gets reflected in stock prices. They looked at the content of the accounting income number and the timing since deficiencies in either of these dimensions could reduce the usefulness of that information. The usefulness could be reduced, due to the fact that many other bits of information are being released in the same month as income. They also found that 85% to 90% of the information provided by accounting income is already reflected in the security price at the time that financial reports are released, a result that is explained by the fact that reports are released 45 to 60 days after the end of the fiscal quarter.

Other studies evaluated how earnings-to-price, book-to-market, and other accounting ratios affect stock returns, and we examined a few of these studies. Fama and French (1995) examined book-to-market equity and how that reflects the behavior of earnings. They looked at how that ratio can capture the stock returns and found that high book-to-market ratio signals persistent poor earnings while low ratio signals strong earnings. Also, they argue that book-to-market ratio is associated with long-term differences in firm profitability. La Porta (1996) examined why the returns on value

stocks were high. He examined two possibilities: (1) high returns compensate for greater fundamental risk, or (2) investors systematically misprice stocks. La Porta concluded that analysts are overly pessimistic about low growth stocks and are overly optimistic about high growth stocks when they forecast expected earnings. Barber and Lyon (1997) analyzed the returns of financial firms, which Fama and French (1992) had excluded from their study, and found that there is a similar relation between book-to-market value ratio and returns in financial firms as there is in nonfinancial firms. Lastly, Kim (1997) reexamined the explanatory power of betas and book-to-market equity while accounting for a selection bias in COMPUSTAT and for errors-in-variables bias. The resulting conclusion was that betas had more explanatory power than thought before, but book-to-market was still a significant explanation of stock returns.

These studies comprise the basis for our current study, where we will examine accounting information and use this historical information to predict future market performance in order to help investors to select stocks for a portfolio.

III. Data and Methodology

Our study takes current stock data to assess whether an investor can earn a higher rate of return by looking at accounting information. By using current data, we are making sure that our conclusions are accurate in the current market. And by using quarterly data, we can have more closely matched information between accounting and stock market return information. We also include a longer sample period for the data. We have decided to analyze the stock data based on two fundamental accounting ratios, book value-to-market value ratio (B/M) and earnings-to-price ratio (E/P).

Data Sample and Criteria

The data that was used in this study was collected from CRSP and Compustat. Market return and price data was collected from CRSP while accounting information data was collected from Compustat. Our sample period goes from January 1, 2006 to December 15, 2015.

Method of Analysis

After the data was collected from CRSP and Compustat, we had two separate data sets, one with the stock market data, the other with the accounting information. Using CUSIP, the unique company identifier that is used by Wharton Research Data Services, we were able to combine these two data sets together into one file by first matching the CUSIP number of every firm present in both data sets and then lining up the dates of each observation correctly. We also calculated the necessary 5-year holding period returns for each company that was used in the analysis to determine market performance.¹ In addition to the 5-year holding period return we also used earnings-to-price (E/P) ratio, book-to-market (B/M) ratio, market value, and stock price in our analysis. Then we ran ANOVA tests based on different portfolios with different E/P and then B/M ratios. This ANOVA test allowed us to see if there is statistical difference in the mean returns of the different portfolios, which then allowed us to make investment decisions based on those results.

¹ This analysis was completed using SAS programs. The program used to compile the data and calculate the 5-year holding period returns is available in Appendix A. The program used for the statistical analysis of this research is provided in Appendix B

IV. Results

Overview of Study

After the data was compiled and was ready to be used for the study, we were able to see if the differences in portfolio returns were statistically significant. To arrive at the final results, we first looked at correlations between the different variables that we included in this study. After we computed the various correlations to determine the different relations, we then moved onto creating quintiles for E/P and B/M ratios. Creating five separate portfolios based on those quintiles, we can analyze differences between the returns of portfolios with low E/P (B/M) and those of portfolios with high E/P (B/M) stocks. Once we had these quintiles of portfolios determined, we run a univariate analysis of variance, or ANOVA test, on these portfolios to determine if there was a statistically significant difference between the returns on the portfolios. We concluded our study by analyzing our results and making investment recommendations based upon this analysis of the separate portfolios.

Variable Correlation Coefficients

The correlations between the different variables were determined using the correlation procedure in SAS. The correlations have been listed in Table 1, which is presented below.

Table 1

Correlation Coefficients of Relevant Variables

Correlation Coefficients were determined for all the independent variables relative to the dependent variable, which was the holding period return in this case.

Correlation Coefficients					
	5 yr. hpr	E/P	B/M	Value	Price
5 year Holding Period Return	1.0000	0.0527	-0.2137	0.0337	0.1188
		<.0001	<.0001	<.0001	<.0001

From these computed correlations, we can see that there are some relations between the variables that we have collected. Most of these correlations are insignificant, the only one that does have significance with the 5-year holding period return is the B/M ratio variable with a correlation coefficient of -0.2137. These correlation coefficients just show us the relationships between the various variables that we have included in this study; next we will be able to see if there are statistically significant differences in the returns based on the different variables.

Univariate Analysis of E/P Portfolios

First, we separated all of the stocks into quintiles based on their E/P ratios. Once we created the different portfolios, we ran an ANOVA test to determine statistical significances in the data, from which we will be able to determine if investors should pay attention to E/P ratios before making investment decisions. The final result of this model allowed us to determine if the mean E/P of the portfolios were significantly different from one another by rejecting the null hypothesis that the 5-year holding period returns of

all the portfolios are equal. Table 2 presents the returns for different E/P portfolios and the respective univariate analysis:

Table 2

E/P portfolios are ranked based on each stocks individual E/P ratio, with the 1st E/P Portfolio having stocks with the lowest E/P ratios, and the 5th E/P Portfolio having stocks with the highest E/P ratios.

1st E/P Portfolio

Variable	Sample	Mean	Std. Dev.	Coefficient
Earnings-to-Price	22,810	-0.6744	3.4804	-516.086
5 year Holding Period Return	21,508	-0.1109	2.1947	-1977.29

2nd E/P Portfolio

Variable	Sample	Mean	Std. Dev.	Coefficient
Earnings-to-Price	22,887	0.0057	0.0356	619.394
5 year Holding Period Return	22,047	1.1204	3.5089	313.187

3rd E/P Portfolio

Variable	Sample	Mean	Std. Dev.	Coefficient
Earnings-to-Price	22,887	0.0451	0.0089	19.861
5 year Holding Period Return	22,527	1.1512	2.3630	205.258

4th E/P Portfolio

Variable	Sample	Mean	Std. Dev.	Coefficient
Earnings-to-Price	22,877	0.0648	0.0100	15.532
5 year Holding Period Return	22,602	0.9989	2.3956	239.798

5th E/P Portfolio

Variable	Sample	Mean	Std. Dev.	Coefficient
Earnings-to-Price	22,831	0.1162	0.1250	107.547
5 year Holding Period Return	22,082	0.8589	2.0106	234.097

Univariate Analysis of E/P Portfolios

ANOVA analysis of the five E/P portfolios to determine if the mean return of each portfolio was different from one another.

Source	DF	Sum of Squares	Mean Square	F Value	Prob > F
Model	4	23,850.63	5,962.66	917.56	<.0001
Error	110761	719,764.85	6.49		
Corrected Total	110765	743,615.48			

As we can see from the tables we have our five E/P portfolios that were created based on the E/P ratios of the stocks in those portfolios. There are noticeable differences across the returns of different quintiles. The 5-year holding period returns first increased and then decreased as the E/P ratio increased. There seemed to not be a systematic relation between standard deviation of returns and the E/P ratio in our sample. From the ANOVA test, we concluded that we should reject the null hypothesis that the mean returns are equal across all five of the E/P portfolios. This means that the returns of the

E/P portfolios do differ across the quintiles, creating a possibility for an investor to earn a higher than normal returns simply by creating portfolios based on companies' E/P ratios.

Univariate Analysis of B/M Portfolios

After completing the ANOVA test for the E/P portfolios, we then went and divided the data into different portfolios, this time based on the firm's B/M ratio and, again, creating five portfolios with different ratios. Once this was done, we were able to run another ANOVA test to see if the mean 5-year holding period return was significantly different across the five portfolios. The null hypothesis was that the mean 5-year holding period return of all five portfolios are not significantly different from one another while the alternative hypothesis was that at least one portfolio's return is significantly different from the rest of the portfolio's returns. These five portfolios and the corresponding ANOVA test are provided below in Table 3.

Table 3

B/M Portfolios were ranked based on stocks individual B/M ratio with the 1st B/M portfolio having stocks with the lowest B/M ratios and the 5th B/M portfolio having stocks with the highest B/M ratio stocks.

1st B/M Portfolio

Variable	Sample	Mean	Std. Dev.	Coefficient
Book-to-Market	21,962	0.1791	0.0834	46.599
5 year Holding Period Return	20,925	1.8616	4.3607	234.234

2nd B/M Portfolio

Variable	Sample	Mean	Std. Dev.	Coefficient
Book-to-Market	22,036	0.3787	0.0934	24.655
5 year Holding Period Return	21,308	1.2108	2.4869	205.403

3rd B/M Portfolio

Variable	Sample	Mean	Std. Dev.	Coefficient
Book-to-Market	22,033	0.5732	0.1334	23.276
5 year Holding Period Return	21,514	0.7619	1.7295	226.981

4th B/M Portfolio

Variable	Sample	Mean	Std. Dev.	Coefficient
Book-to-Market	22,036	0.8256	0.2116	25.633
5 year Holding Period Return	21,622	0.3931	1.2809	325.823

5th B/M Portfolio

Variable	Sample	Mean	Std. Dev.	Coefficient
Book-to-Market	21,988	1.6491	1.3449	81.559
5 year Holding Period Return	21,486	-0.0479	1.0042	-2,092.05

Univariate Analysis of B/M Portfolios

ANOVA analysis of the B/M Portfolios to determine statistical differences in the mean returns.

Source	DF	Sum of Squares	Mean Square	F Value	Prob > F
Model	4	46,148.24	11,537.06	1,893.20	<.0001

Error	106,850	651,136.52	6.09		
Corrected Total	106,854	697,284.75			

We can see that the returns of these portfolios do differ across the quintiles, most notably the B/M ratio is increasing over the quintiles, while the 5-year holding period return is decreasing over the quintiles. Standard deviation is also increasing as we advance through the portfolios. From our analysis of the five B/M portfolios, we can see that we have a statistically significant F-value, so therefore we can reject the null hypothesis that all the 5-year holding period returns are the same for each of the portfolios.

From the results of both of these tests we have seen that returns of portfolios created based on E/P and B/M ratios differ significantly across different quintiles. These results suggest that both the E/P and the B/M ratios do warrant an investors attention because there is the potential to make abnormal returns in the market simply by analyzing those ratios. These results are quite interesting because, in an efficient market, an investor should not be able to earn abnormal returns simply by looking at and analyzing simple accounting and financial ratios. Nevertheless, we have shown that it is possible to earn abnormal returns based on simply analysis of the E/P and the B/M ratios of a firm.

V. Conclusion

In conclusion, we have been able to confirm that accounting information can be used to determine market performance of a stock. In particular, earnings-to-price ratio and book-to-market value ratios were found to be important accounting factors in determining market performance. The implications of this study have yielded the fact that investors

can earn abnormal returns simply by looking at and analyzing accounting information and ratios. By collecting stock market and accounting data, computing E/P and B/M ratios for a large sample of stocks, and separating these stocks into portfolios based on these ratios, we could run ANOVA tests to determine the statistical significance of the differences in portfolio returns. At the end, we were able to conclude that the returns from these different portfolios based on earnings-to-price or book-to-market ratios are significantly different. Lastly, for future research, we may be able to even narrow the cause of some abnormal returns down even further by running these tests on specific industries or even by looking at different firm sizes.

Appendix A

5-year holding period return SAS program

```
libname lib 'C:\Users\Tyler\Documents\SAS_Honors_Project'; run;

data crsp;
set lib.qe514970aee03295f;
prc = abs(prc);
c6 = substr(ncusip,1,6);

proc sort data = crsp; by permco date vol;

data crsp;
set crsp;
by permco date vol;
if last.date;
run;

data ret (keep = date permno date ret);
set crsp;

data evntdate (keep = permno evntdate);
set crsp;
where '01JAN2006'd <= date <= '31DEC2015'd;
informat evntdate YYMMDD6.;
format evntdate YYMMDDN8.;

evntdate = date;

proc sql;
    create table returns as select *
    from evntdate as a left join ret as b
    on a.permno = b.permno;
quit;

proc sort data=returns; by permno evntdate date;

data returns;
set returns;

before = date < evntdate;

proc means data=returns noprint; by permno evntdate;
    output out=nreturns(drop=_type_ _freq_) sum(before)= bef_sum;

data estper;
merge returns(drop=before) nreturns;
by permno evntdate;
if first.evntdate then relday=-bef_sum - 1;
relday + 1;
if -59 <= relday <= 0 then output estper;
```

```

proc sort data=returns; by permno evntdate date;

data estper;
set estper;
where bef_sum >= 60;
by permno evntdate;

retain unoret;
if first.evntdate then unoret=1;
unoret=unoret*(1+ret);

data estper (keep = permno date hpr5yr);
set estper;
where relday = 0;

hpr5yr = unoret - 1;

proc sort data=estper nodup ; by permno date;

data crsp;
set crsp;
where '01JAN2006'd <= date <= '31DEC2015'd;
format psdate yymmddn8.;
psdate = intnx('month',date,0,'end');

proc sort data = crsp nodup; by permno date;

proc sql;
create table crsp
as select *
from crsp as a, estper as b
where a.permno = b.permno and a.date = b.date;
quit;

proc sort data = crsp nodup; by permno date;
run;

data compustat;
set lib.q137395d6ca5f84ce;
bm = CEQQ/(PRCCQ*CSHOQ);
mktval = PRCCQ*CSHOQ;
c6 = substr(cusip,1,6);

proc sql;
create table temp1
as select *
from crsp as a, compustat as b
where a.c6 = b.c6 and a.psdate = b.datadate;
quit;

proc sort data = temp1; by permco date datadate;

data temp2;
set temp1;
by permco date;
if last.date;

```

```

data lib.temp3 (keep = cusip psdate hpr5yr price eps bm mktval);
retain cusip psdate hpr5yr price eps bm mktval;
set temp2;

cusip = ncusip;
price = prc;
eps = OEPS12; run;

proc sql;
create table dupes
as select *, count(*) as count
from temp2
group by cusip, psdate
having count(*)>1;
quit;
run;

```

Appendix B ²

SAS program for statistical analysis

```
libname lib 'C:\Users\Tyler\Documents\SAS_Honors_Project'; run;

data base (drop = yy mm);
  set lib.temp3;
  ep = eps/price;
  yy = year(psdate);
  mm = month(psdate);
  yymm = yy*100+mm;
  if bm < 0 then bm = .;
  if ep = . then delete;
  label hpr5yr = '5yr holding period return';
  label ep = 'earnings-to-price ratio';
  label bm = 'book-to-market ratio';
  label mktval = 'market value';
  label price = 'market price';
run;

proc corr data=base;
  title 'correlation analysis of relevant variables';
  var hpr5yr ep bm mktval price;
run;

proc sort data=base;
  by yymm;
proc rank data=base groups=5 out=baseranks;
  var ep bm mktval price;
  ranks rank_ep rank_bm rank_mktval rank_price;
  by yymm;
run;

proc sort data=baseranks;
  by rank_ep;
proc means data=baseranks n mean std cv;
  title 'univariate analysis of earnings/price portfolios';
  by rank_ep;
  var ep bm hpr5yr rank_mktval rank_price ;
proc anova data=baseranks;
  class rank_ep;
  model hpr5yr = rank_ep;
  quit;
run;

proc sort data=baseranks;
  by rank_bm;
proc means data=baseranks n mean std cv;
  title 'univariate analysis of book-to-market portfolios';
  by rank_bm;
  var ep bm hpr5yr rank_mktval rank_price;
proc anova data=baseranks;
  class rank_bm;
  model hpr5yr = rank_bm;
  quit;
run
```

² This program is a modified program from “Using SAS in Financial Research”, see Boehmer (2002).

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